AMC

Horizontal Technology Integration for Indirect Fire Weapon Platforms

TACOM

Presented To:

Armaments for the Army of the Future

NDIA Symposium and Exhibition

June 22-24, 1998

Parsippany, NJ

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Current Environment for Indirect Digital Fire Control

Only one fielded digital system - Paladin

Numerous fire control developments/planned improvements

- ***MFCS in EMD***
- ***Crusader in DemVal***
- ***LW155 P3I***
- ***M198***
- ***ATLAS***
- ***Paladin Upgrade?, Others?***

Continued compatibility upgrades expected to SA and FS Nets

Potential for proliferation of unique solutions

The Premise

A common solution for fire control for Indirect Fire systems is a necessary, feasible, cost effective developmental approach

The Mortar Fire Control System (MFCS) is an example of the common approach

Why a Common Solution?

The fire control functions are the same - their implementation varies

The "weapon -specific" technical requirements are essentially the same

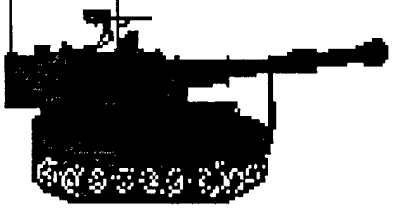
The "Weapon-Independent" mandated requirements are the same, are significant cost drivers and will continue

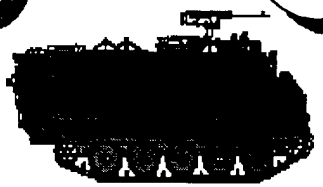
The Fire Control Functions

Determine Position/ Navigate

Projectile Interface e.g. XM982; future autoreg

1 Mil Accuracy; auto lay



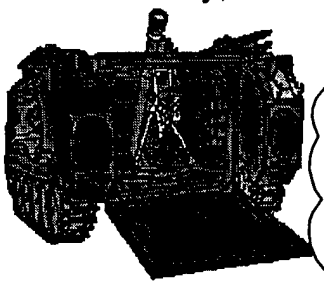


Weapon Position and Control

Communicate on Sit Aware &FS Nets

Provide Embedded Training and Test

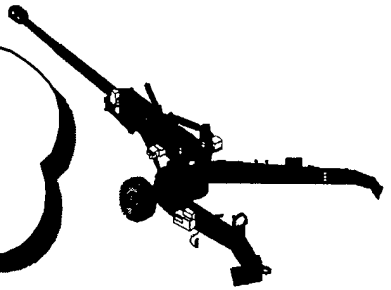
3 Mil Accuracy; manual lay



Armament System control- e.g. Laser Ign; Recoil Management

Technical Fire Control/Data Processing

1 Mil Accuracy; manual lay



Weapon-Specific Technical Fire Control Requirements

	Paladin	MFCS	JLW155 3nd Gen	M198 (Notional)	ATLAS (Notional)	Next Gen Paladin
Position	10M	10M	10M	10M	10M	10M
Navigation	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
Communication	SIP/TCIM	SIP/TCIM	SIP/TCIM/EPLRS	SIP/TCIM/EPLRS	SIP/TCIM/EPLRS	SIP/TCIM/EPLRS
- Fire Support	V10-13+	V11-13+	V13+	V13+	V13+	V13+
- Tactical Net	EBC	EBC	EBC	EBC	EBC	EBC
- Intersystem	VIS/1553/422/232	RF LAN/422/232	RF LAN/422	RF LAN/422	RF LAN/422	RF LAN/422
Pointing Accuracy	1M	3M	1M	1M	1M	1M
SMI	Text/GUI	GUI/Text Smart!	GUI/Text Smart?	GUI/ Text Smart?	GUI/Text Smart?	GUI/Text Smart!

Weapon-Specific Technical Fire Control Requirements (Cont'd)

	Paladin	MFCS	JLW155 P3I	M198 (Notional)	ATLAS (Notional)	Next Gen Paladin
Power	Mil-S-1275	Mil-S-1275/ 12 hr Battery	State-of-the-Art	State-of-the-Art	State-of-the-Art	State-of-the-Art
Platform Intgrn	~10 Cables	Wireless LAN	Wireless LAN?	Wireless LAN?	Wireless LAN?	Wireless LAN?
Weapon Drive	Yes	No	Yes?	Yes?	Yes?	Yes
DFSS	Pantel	No	Yes	Yes	Yes	Yes?
MVS	Yes	No	Yes	Yes	Yes	Yes
Embedded Trng	Yes	Yes	Yes	Yes	Yes	Yes
Muzzle RS	No	No	Yes?	Yes?	Yes?	Yes?
BIT	Yes	Yes	Yes	Yes	Yes	Yes
Fuze Setter Intgrn (PIAFS)	Planned	Planned	Required	Required	Required	Required

"Weapon-Independent" Mandated Requirements

Joint Technical Army Architecture (JTA-A)

- Operating system
- Program language
- Soldier Machine Interface (SMI)

Situational Awareness

- *SA Software:* FBCB2/EBC
- *Radios*: SINCGARS SIP/INC/EPLRS/Future Data Radios

FS Net

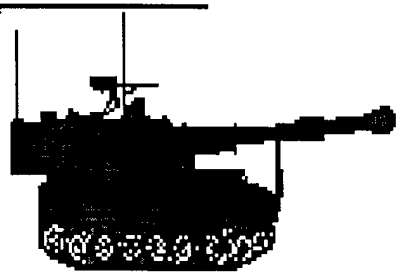
- Message Formats: FSK, VMF,JVMF
- Protocols: 188-220

SW Reuse

- Ballistic Kernel
- Comm Server
- etc...

Battlefield Combat ID System (BCIS) - IFF

The Evolution of Paladin



A3s→HELP→HIP→Paladin

- First digitized ground combat vehicle
- Only digitized indirect fire platform
- Product improved with MVS, DRU-H
- AFCS XXI, Pack 10 FY97
- Pack 11 in FY 99 (Ballistic Kernel, VMF BOM)
- Pack 12 in FY 00 FDD (EBC)
- Pack 13 (MOFA, MACS, XM982)
- New display required for situational awareness
- PM considering upgrade Fire Control in 01/02 timeframe
- Continued compatibility upgrades expected

What's best for the Indirect Fire Community?

A structured approach for coordinated definition and development of fire control for indirect fire weapon systems

State-of-the-art hardware, best value IAW performance spec, warranty, CLS and maximum commonality with existing systems

Flexible Architecture - ability to isolate SW from HW: SW reuse/rehosting

Ability to procure competitively and economically via common performance specifications at the subsystem level

Horizontal Technology Integration of complementary hardware and software elements

Advantages

Maximum use of existing, proven HW & SW

Applicable to all indirect fire (and other) systems

Promotes HW commonality

Reduces EMD, Prod, Training, O&S Costs

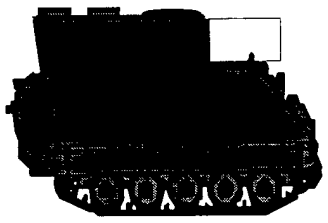
Growth Oriented, concurrent deployment of technology & capabilities

Enables modernization through spares

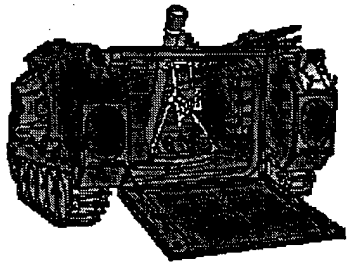
Same solution for M198, LW155, Atlas, next version Paladin

Mortar Fire Control System

Five platforms addressed concurrently



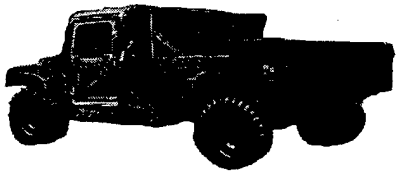
M577 Fire Direction Center



Tracked 120mm

Towed 120mm

81 mm mortar



HMMWV Fire Direction Center

Single performance specification

Mortar Fire Control System (MFCS)

- **Provides complete, fully integrated digital on-the-weapon fire control system for mortars:**
  - Weapon location and orientation
  - Navigation
  - Ballistic solution
- **Plus:**
  - Full FDC Functionality.
  - VMF/BOM, 188-220 compatible.
  - Compatible with all Package 11 FA systems.
  - Army Technical Architecture compliant.

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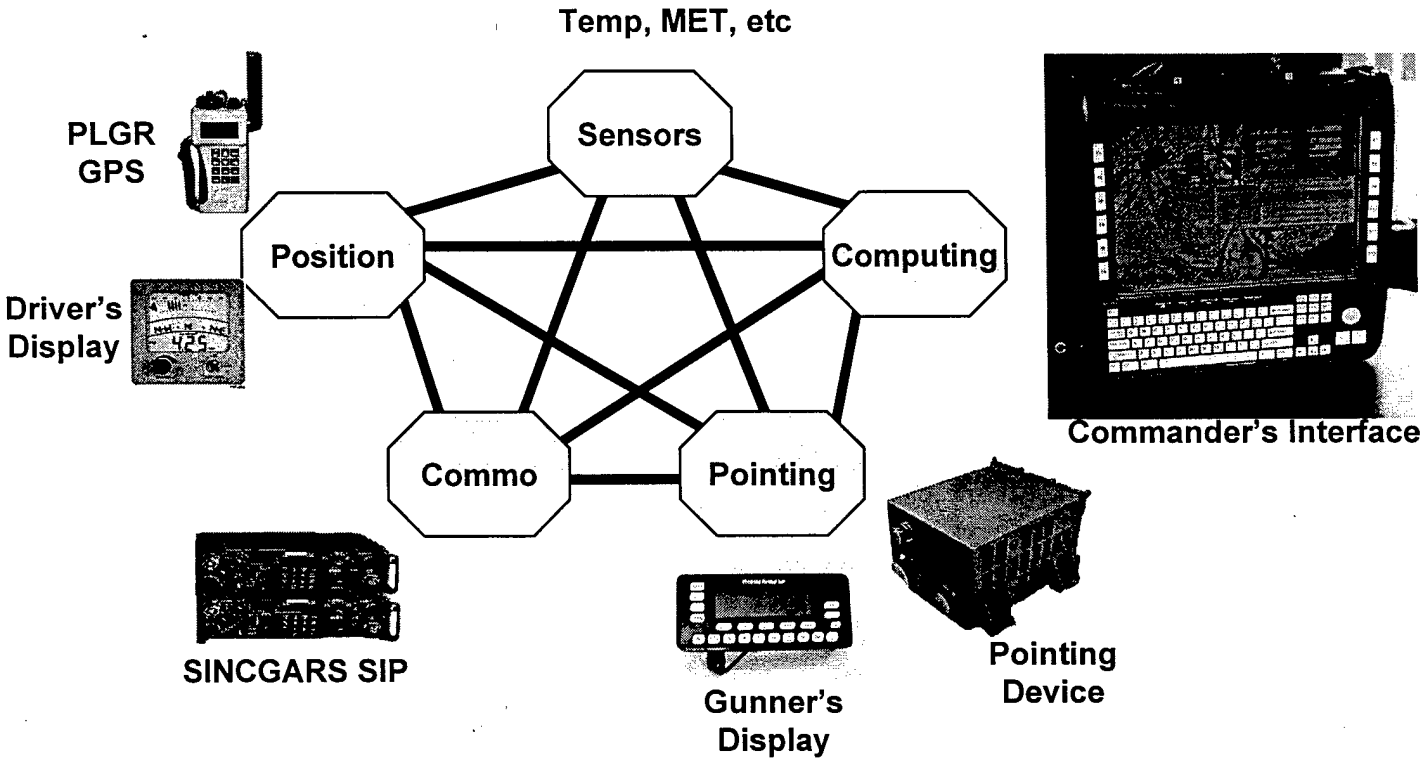
MFCS Architecture - Function/Hardware



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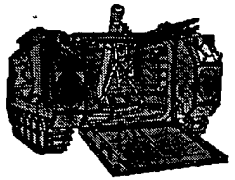
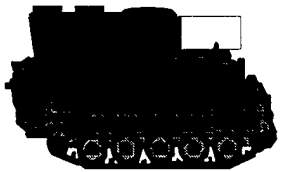
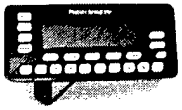
MFCS Modular Cross-Platform Application




	M1064	120mm	81mm	FDC Heavy	FDC Light
 C I	✓	✓	✓	✓	✓
 PD	✓	✓	✓		
 GD	✓	✓	✓		
 DD	✓			✓	✓
 PLGR	✓	✓	✓	✓	✓

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MFCS Weapon Lay

- **MFCS On-Board Survey System:**
  - Eliminates Need for Aiming Posts and Distant Aiming Points.
  - Permits On-the-Move Computation of Targeting Solutions.
  - Facilitates Paladin-like Shoot-and-Scoot Capability.
  - Provides Real-Time Position Data for Situation Awareness.
- **MFCS On-Board Pointing System and Displays:**
  - Provide Real-Time Orientation Data to Gunner.
  - Presents Gun Orders to both Gunner and Commander.
  - Presents Weapon Lay data to driver.

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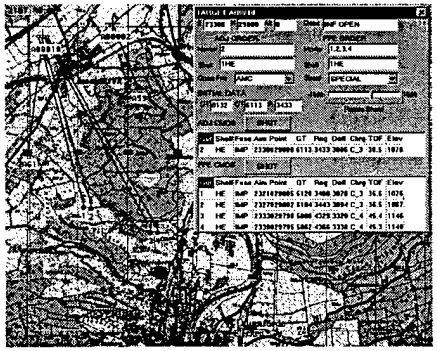
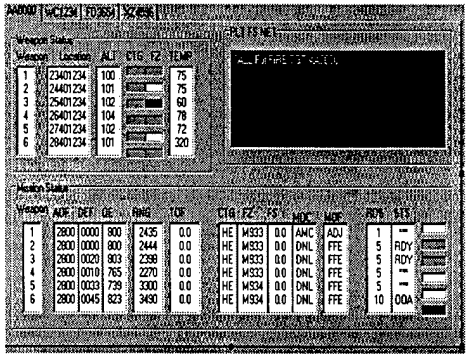
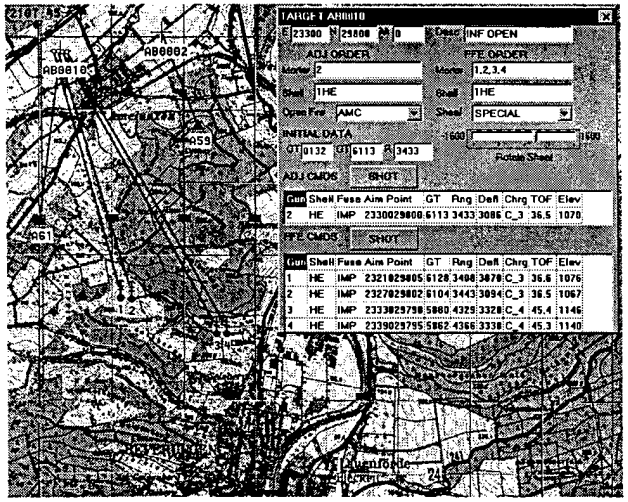
MFCS Safety

- **MFCS On-Board Safety Measures:**
  - Safety Fans
  - Battlefield Geometry
  - Embedded Battle Command / Common Picture
  - Effectiveness Checks for all 120mm and 81mm Ammunition
  - Warns of endangered Friendly
  - Alerts of possible danger close situation





MFCS Tactical Fire Direction



- **MFCS Tactical Data Management:**
  - Graphical User Interface
  - Platoon Level Data Management
  - Weapons Control
  - Simultaneous Independent Missions
  - Coordination of Fires
  - Coordination of Re-supply
  - Selectable User Preferences / Defaults
  - Integrated Situation Awareness

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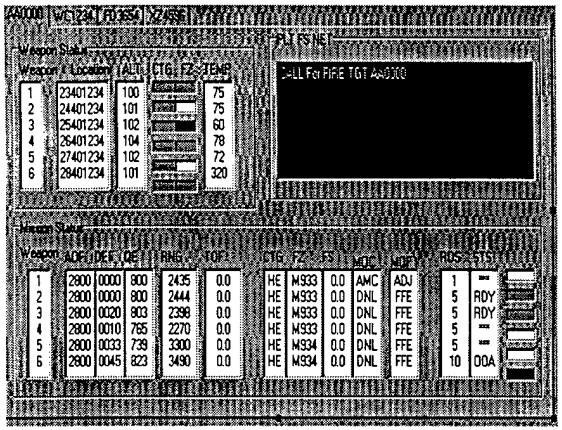
MFCS Technical Fire Direction

- **MFCS Technical Fire Control:**
  - Graphical User Interface
  - Ballistic Computation
  - Generation of Gun Orders
  - Weapons Inventory Status and Control
  - Automatic Decrement of Inventory
  - Compensation for MET
  - Compensation for Propellant Temp.



MFCS Embedded Training

- **MFCS On-Board Embedded Training Aids**
  - Mission Simulations
  - Monitor/Record User Interaction
- **Embedded Training Mode for Tactical Operations**
  - Platoon Level Training
  - Unit Level Training
    - Simulation of Inbound Tactical Messages and Commands
    - Simulated Fires
    - Data-Logging

[redacted]

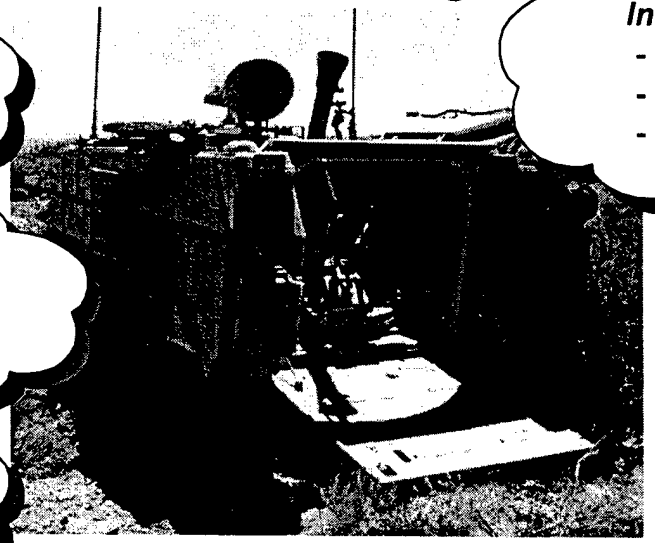
MFCS Attributes

Summary

Enhanced Lethality:
- First round FFE
- New weight class

Increased Survivability:
- No dismount
- Shoot & Scoot
- Semi-auto ops

Faster Response Times:
- Digital commo
- On board ballistics



Increased Mobility:
- Decreased emplace times
- On board POS/NAV

Situational Awareness:
- Current friend or foe situation

- *Modular Architecture*
  - *Hardware/Software*
- *AFATDS Key Asset*
- *ATA-Compliant*
- *VMF/BOM,188-220*
- *FA Package 11Compliance*

System Fielding FY2000

Conclusion

The approach is feasible

Now is the opportune time to address commonality

Reduces cost, risk, development time

Same solution for M198, LW155, Atlas, next version Paladin; technology interchange with Crusader

A coordinated approach is the <u>only affordable</u> solution